Tactical Combat Casualty Care (*TC-3*)

Introduction

- Soldiers continue to die on today's battlefield just as they did during the Civil War. The standards of care applied to the battlefield have always been based on civilian care principles. These principles while appropriate for the civilian community, often do not apply to care on the battlefield.

Introduction

- Civilian medical trauma training is based on the following principles:

- Emergency Medical Technicians
- Pre-Hospital Trauma Life Support (PHTLS)
- Advanced Trauma Life Support (ATLS)

Introduction

- Tactical Combat Casualty Care (TC-3) has been approved by the American College of Surgeons and National Association of EMTs and is included in the Pre-hospital Trauma Life Support (PHTLS) manual 5th edition.

Introduction

- Three goals of TC-3:
  1. Treat the casualty
  2. Prevent additional casualties
  3. Complete the mission

Introduction

- This approach recognizes a particularly important principle:
- Performing the correct intervention at the correct time in the continuum of combat care. A medically correct intervention performed at the wrong time in combat may lead to further casualties.

Introduction

- Pre-hospital care continues to be critically important.
- Up to 90% of all combat deaths occur before a casualty reaches a Medical Treatment Facility (MTF).
- Penetrating vs. blunt trauma.

Factors influencing combat casualty care

- Enemy Fire
- Medical Equipment Limitations
- Widely Variable Evacuation Time

Factors influencing combat casualty care

- Tactical Considerations
- Casualty Transportation

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Stages of Care

- Care Under Fire
- Tactical Field Care
- Combat Casualty Evacuation Care

Care Under Fire

- “Care under fire” is the care rendered by the soldier medic at the scene of the injury while they and the casualty are still under effective hostile fire. Available medical equipment is limited to that carried by the individual soldier or soldier medic in their medical aid bag.

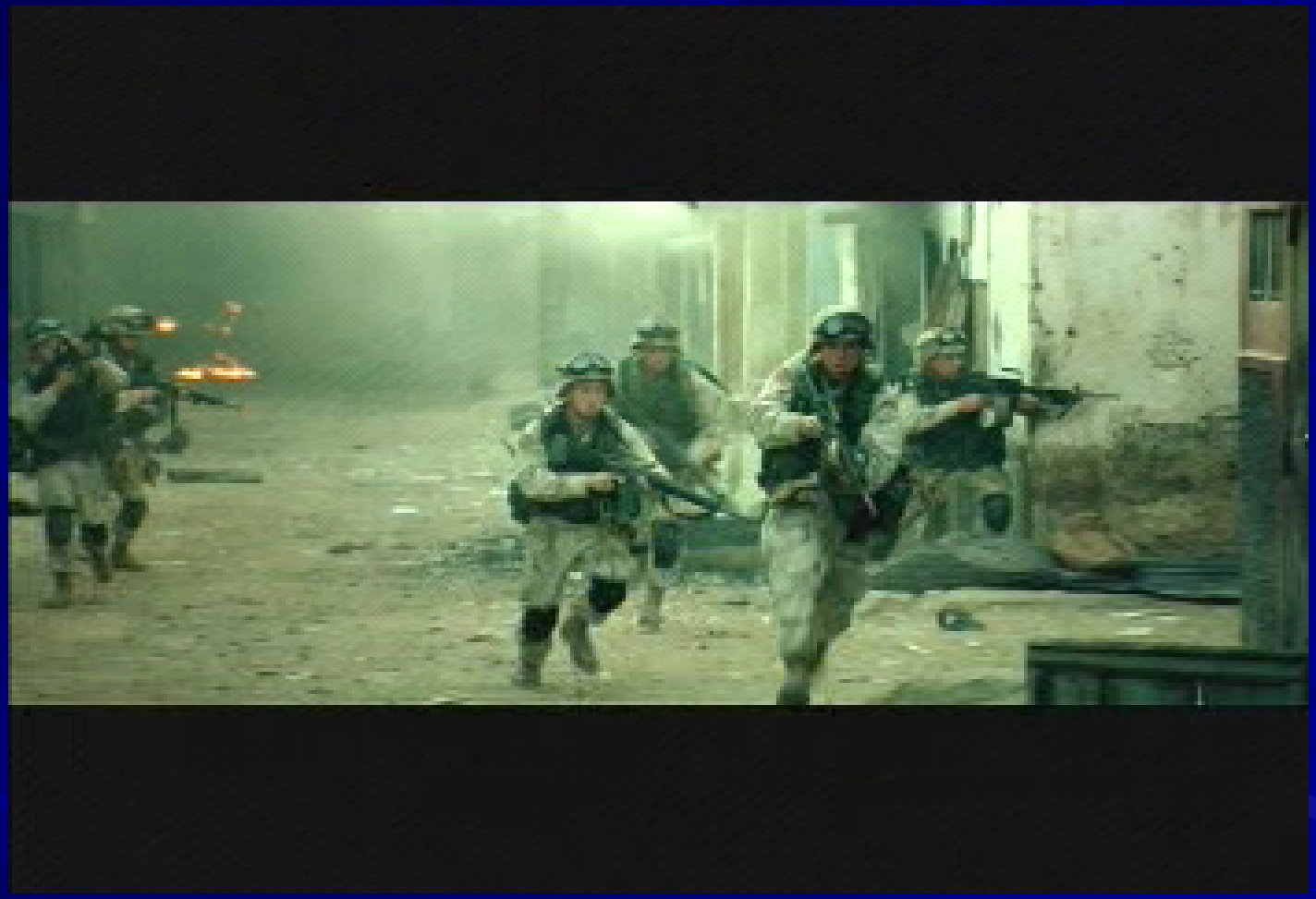
Tactical Field Care

- “Tactical Field Care” is the care rendered by the soldier medic once they and the casualty are no longer under effective hostile fire. It also applies to situations in which an injury has occurred, but there has been no hostile fire. Available medical equipment is still limited to that carried into the field by medical personnel. Time to evacuation to an MTF may vary considerably.

Combat Casualty Evacuation Care

- “Combat Casualty Evacuation Care” is the care rendered once the casualty has been picked up by an aircraft, vehicle or boat. Additional medical personnel and equipment may have been pre-staged and available at this stage of casualty management.

Care Under Fire



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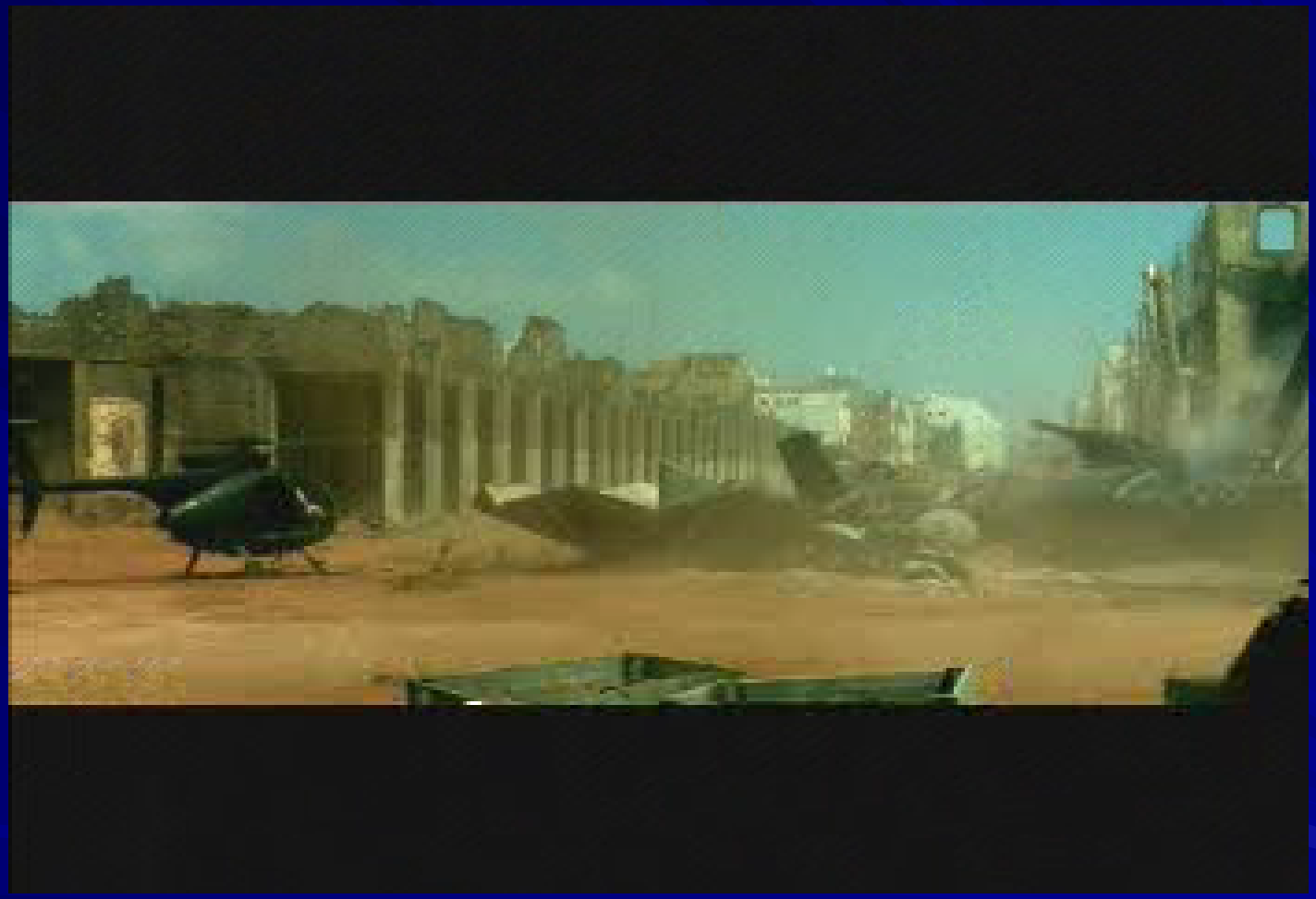

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Care Under Fire

- Medical personnel's firepower may be essential in obtaining tactical fire superiority. Attention to suppression of hostile fire may minimize the risk of injury to personnel and minimize additional injury to previously injured soldiers.

Care Under Fire

- Personnel may need to assist in returning fire instead of stopping to care for casualties.
- Wounded soldiers should return fire if able and or move as quickly as possible to any nearby cover.


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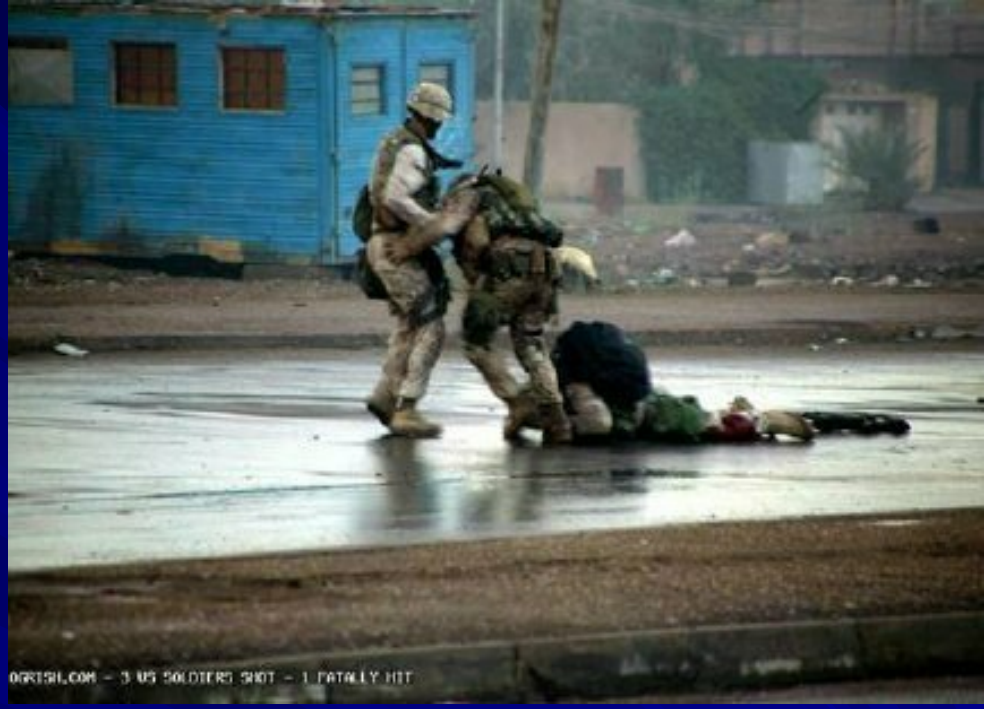
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Care Under Fire

- Medical personnel are limited and if injured, no other medical personnel may be available until the time of extraction during the CASEVAC phase.
- No immediate management of the airway is necessary at this time due to limited time available and the movement of the casualty to cover.

Care Under Fire

- Control of hemorrhage is important since injury to a major vessel can result in hypovolemic shock in a short time frame.

- Over 2,500 deaths occurred in Viet Nam secondary to hemorrhage from extremity wounds.

Care Under Fire

- Use of temporary tourniquets to **stop the bleeding** is essential in these types of casualties.

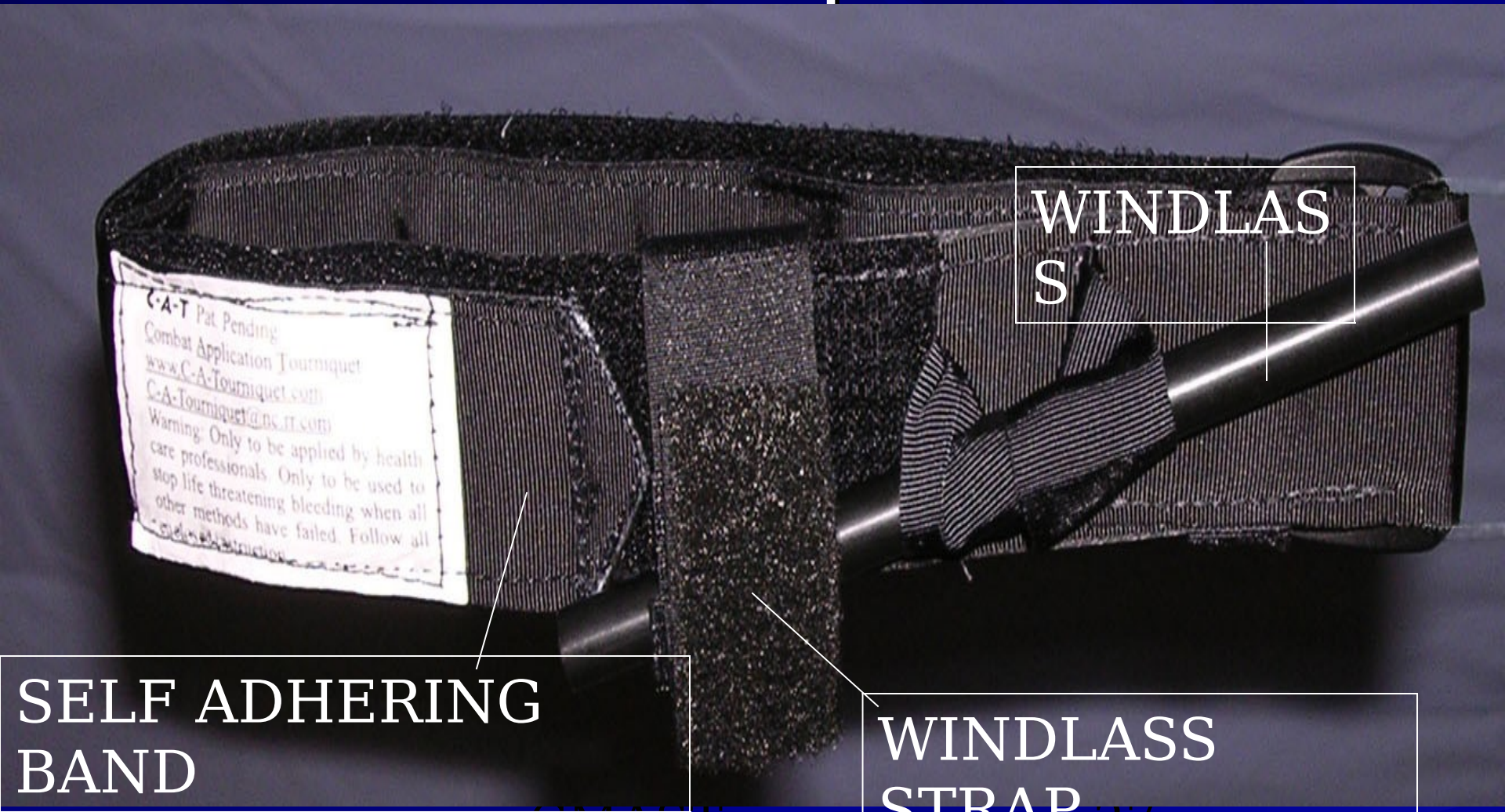

Soldier medic first to die; soldiers: no equipment or training?

Tourniquet

Care Under Fire

- The need for immediate access to a tourniquet in such situations makes it clear that all soldiers on combat missions have a suitable tourniquet readily available at a standard location on their battle gear and be trained in its use.

Combat Application Tourniquet



Hemorrhage Control

- If the wound is not an extremity wound and a tourniquet is not applicable such as:
  - Neck injury
  - Axillary injury
  - Groin injury
  - Apply a HemCon hemostatic bandage with pressure to control the bleeding

Pressure & HemCon Bandage

Care Under Fire

- Penetrating neck injuries do not require C-spine immobilization. Other neck injuries, such as falls over 15 feet, fast-roping injuries or MVAs may require C-spine control **unless** the danger of hostile fire constitutes a greater threat in the judgment of the soldier medic.

Care Under Fire

- Conventional litters may not be available for movement of casualties. Consider alternate methods to move casualties such as a SKED® or Talon II® litter. Smoke, CS and vehicles may act as screens to assist in casualty movement.

SKED Litter

Talon II Litter

Care Under Fire

- Do not attempt to salvage a casualty's rucksack unless it contains items critical to the mission.

- Take the casualty's weapon and ammunition if possible to prevent the enemy from using them against you.

Key Points

- Return fire as directed or required.
- The casualty(s) should also return fire if able.
- Direct casualty to cover and apply self-aid if able.
- Try to keep the casualty from sustaining any additional wounds.
- Airway management is generally best deferred until the Tactical Field Care phase.
- Stop any life-threatening hemorrhage with a tourniquet or a HemCon bandage if applicable.

Tactical Field Care

Tactical Field Care

- Is distinguished from the Care Under Fire phase by having more time available to provide care.
- A reduced level of hazard from hostile fire.

Tactical Field Care

- In some cases, tactical field care may consist of rapid treatment of wounds with the expectation of a re-engagement of hostile fire at any moment. In some circumstances, there may be ample time to render whatever care is available in the field. The time to evacuation may be quite variable from 30 minutes to several hours.

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Click on picture for video

Tactical Field Care

- If a victim of a blast or penetrating injury is found without a pulse, respirations or other signs of life…

  Do Not attempt CPR

- Casualties with an altered mental status should be disarmed immediately, both weapons and grenades.

Tactical Field Care

Initial assessment consists of:

- Airway
- Breathing
- Circulation

Tactical Field Care

- Open the airway with a jaw-thrust maneuver; if unconscious insert a nasopharyngeal airway or Combitube.

Airway Support

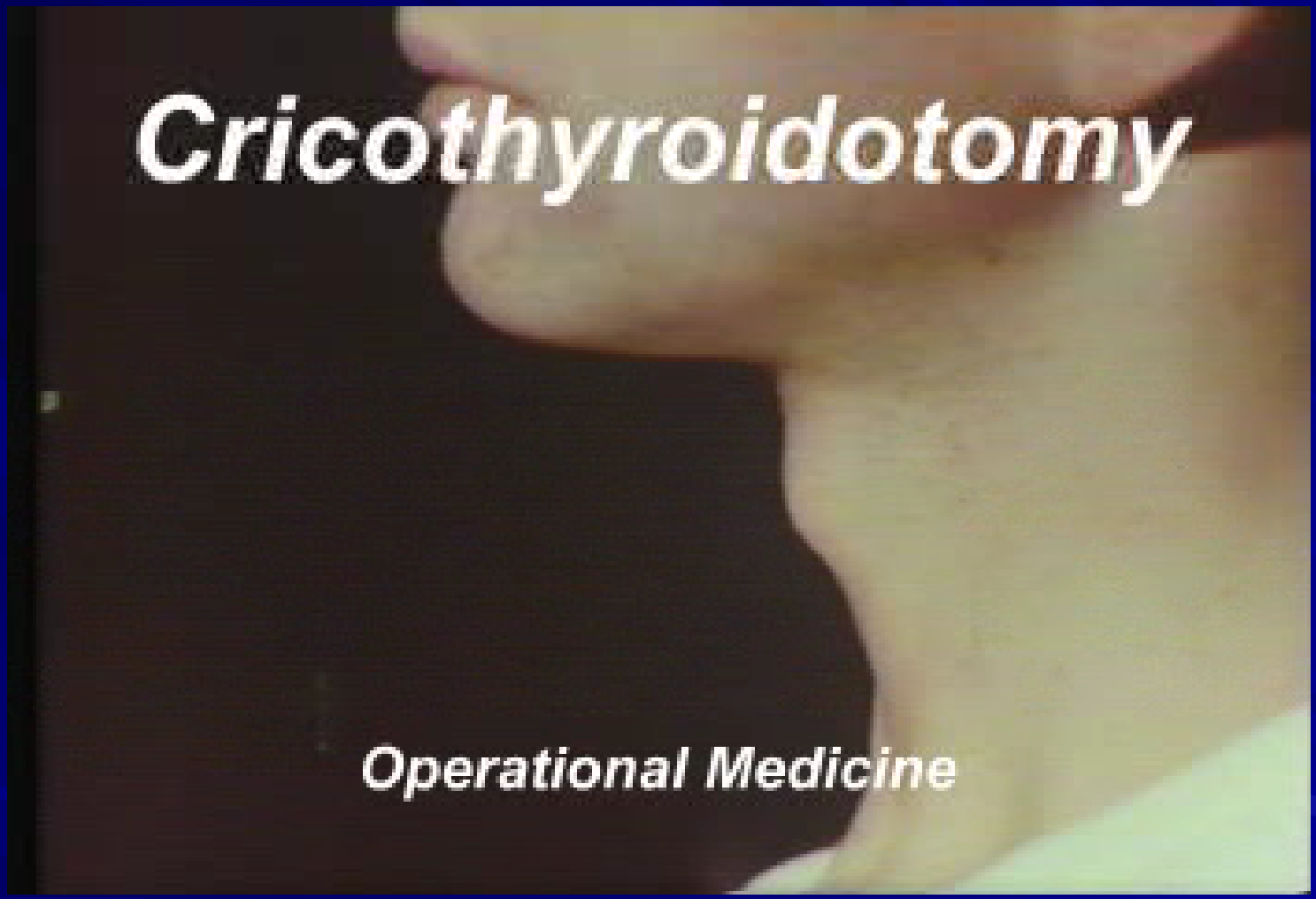
- Allow a conscious casualty to assume any position that best protects the airway, to include sitting up.
- Place unconscious casualties in the re
positior

NPA or Combitube

Tactical Field Care

- Airway:

- If the casualty is unconscious with an obstructed airway, perform a surgical cricothyroidotomy.



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Tactical Field Care

- Airway:

- Oxygen is usually not available in this phase of care.

Tactical Field Care

- Breathing:
- Traumatic chest wall defects should be closed with an occlusive dressing (Vaseline gauze) without regard to venting one side of the dressing or use an “Asherman Chest Seal®”. Place the casualty in the sitting position if possible.

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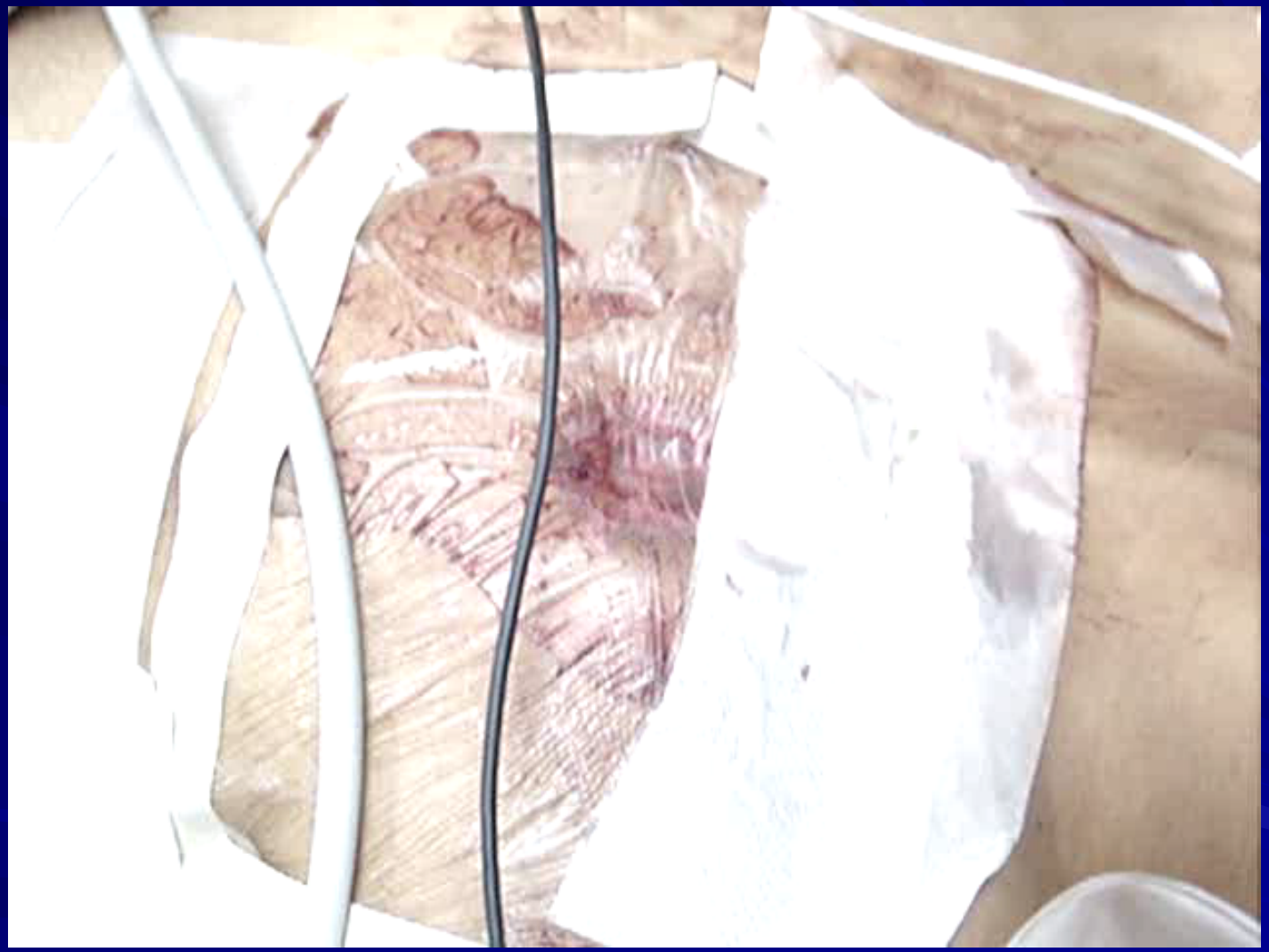

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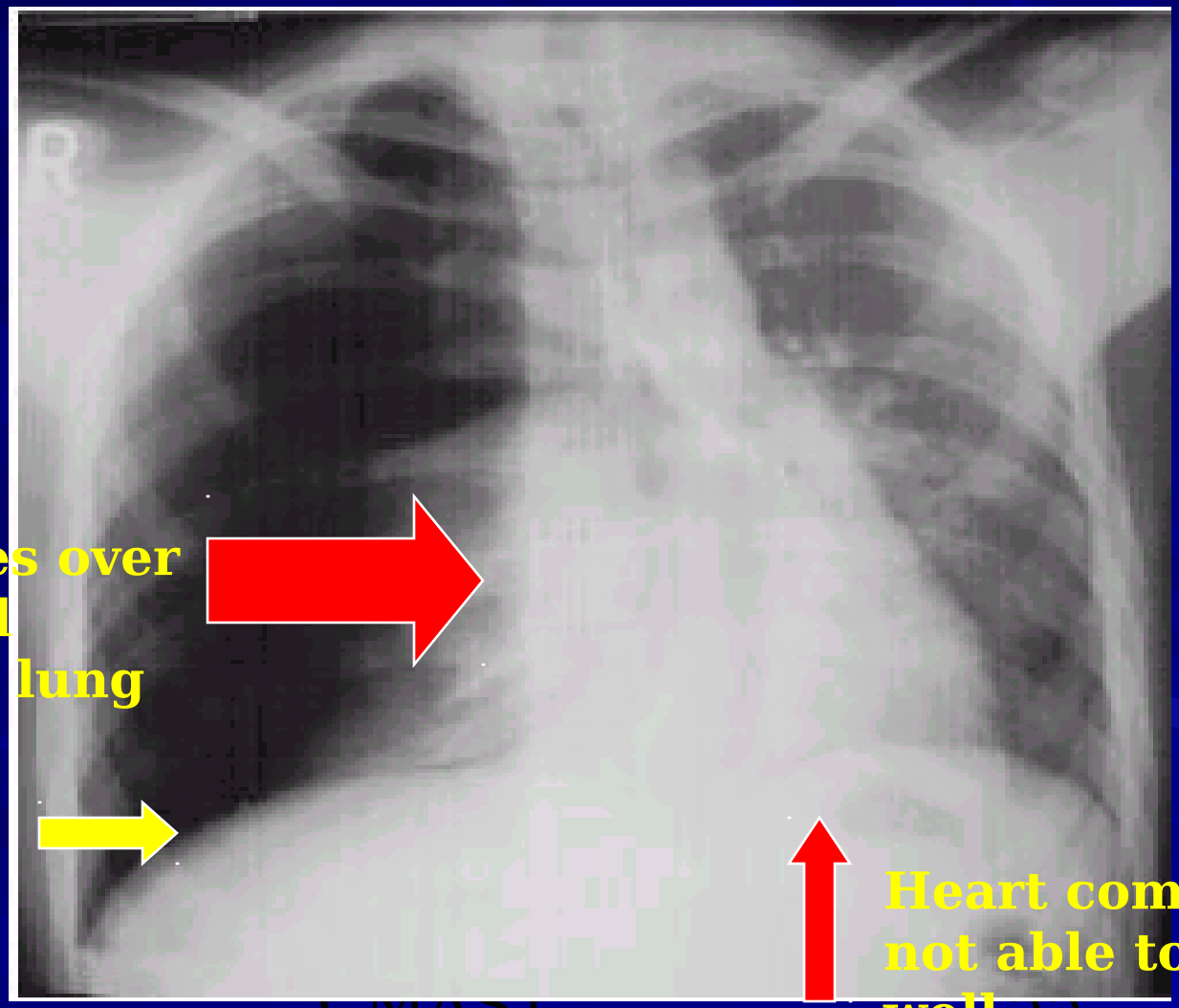
"Asherman Chest Seal"

Tactical Field Care

- Progressive respiratory distress, secondary to a unilateral penetrating chest trauma, should be considered a tension pneumothorax and decompressed with a 14 gauge needle.
- Tension pneumothorax is the 2nd leading cause of preventable death on the battlefield.

Tension Pneumothorax

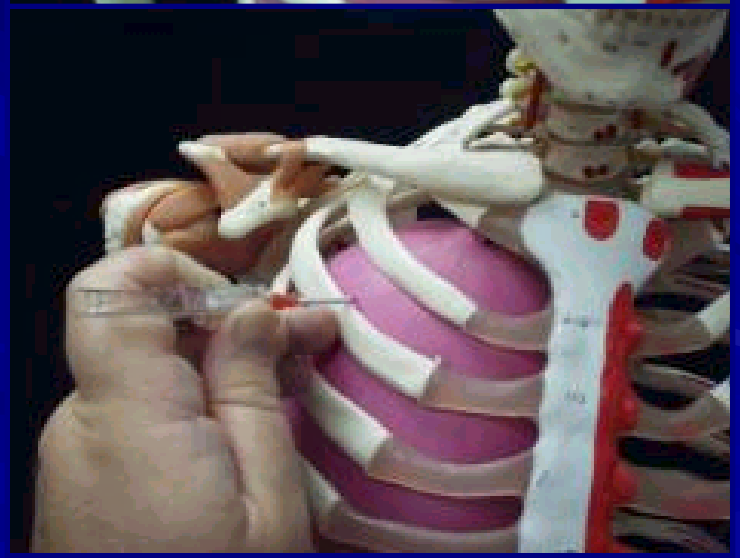


Air pushes over heart and collapses lung

Air outside lung from wound

Heart compressed not able to pump well

Needle Chest Decompression



Tactical Field Care

- Bleeding:
- Any bleeding site not
- previously controlled shou
  now be addressed. Only
  absolute minimum of
  clothing should be remov

Tactical Field Care

- Significant bleeding should be controlled using a tourniquet as previously described.
- Once the tactical situation permits, consideration should be given to loosening the tourniquet and using direct pressure or hemostatic bandages (HemCon) or hemostatic powder (QuikClot) to control any additional hemorrhage.

Tourniquet Removal

- When? Based on the tactical situation.
- More time in a safer setting.
- More help available.
- Can you see what you are doing?
- Does the casualty need fluid resuscitation? If so, do it before the tourniquet is removed (ensure a positive response is obtained, good peripheral pulse mentation).

Tourniquet Removal

- DO NOT periodically loosen the tourniquet to get blood to the limb.
- Can be rapidly fatal.
- Tourniquets are very painful.
- If the tourniquet has been on for > 6hrs, leave it on.
- If unable to control bleeding with other methods-retighten the tourniquet.

Hemostatic Agents

- HemCon® Bandage:

- QuikClot® Powder:

Chitosan Hemostatic Dressing

- Hold the foil over-pouch so that instructions can be read. Identify unsealed edges at the top of the over-pouch.

Chitosan Hemostatic Dressing

- Peel open over-pouch by pulling the unsealed edges apart.

Chitosan Hemostatic Dressing

- Trap dressing between bottom foil and non-absorbable green/black polyester backing with your hand and thumb.

Chitosan Hemostatic Dressing

- Hold dressing by the non-absorbable polyester backing and discard the foil over-pouch. Hands must be dry to prevent dressing from sticking to hands.

Chitosan Hemostatic Dressing

Chitosan Hemostatic Dressing

- Place the light colored sponge portion of the dressing directly to the wound area with the most severe bleeding. Apply pressure for 2 minutes or until the dressing adheres and bleeding stops. Once applied and in contact with the blood and other fluids, the dressing cannot be repositioned.
- A new dressing should be applied to other exposed bleeding sites. Each new dressing must be in contact with tissue where bleeding is heaviest. Care must be taken to avoid contact with the casualty's eyes.

Chitosan Hemostatic Dressing

- If dressing is not effective in stopping bleeding after 4 minutes, remove original and apply a new dressing. Additional dressings cannot be applied over ineffective dressing.
- Apply a battle dressing/bandage to secure hemostatic dressing in place.
- Hemostatic dressings should only be removed by responsible persons after evacuation to the next level of care.

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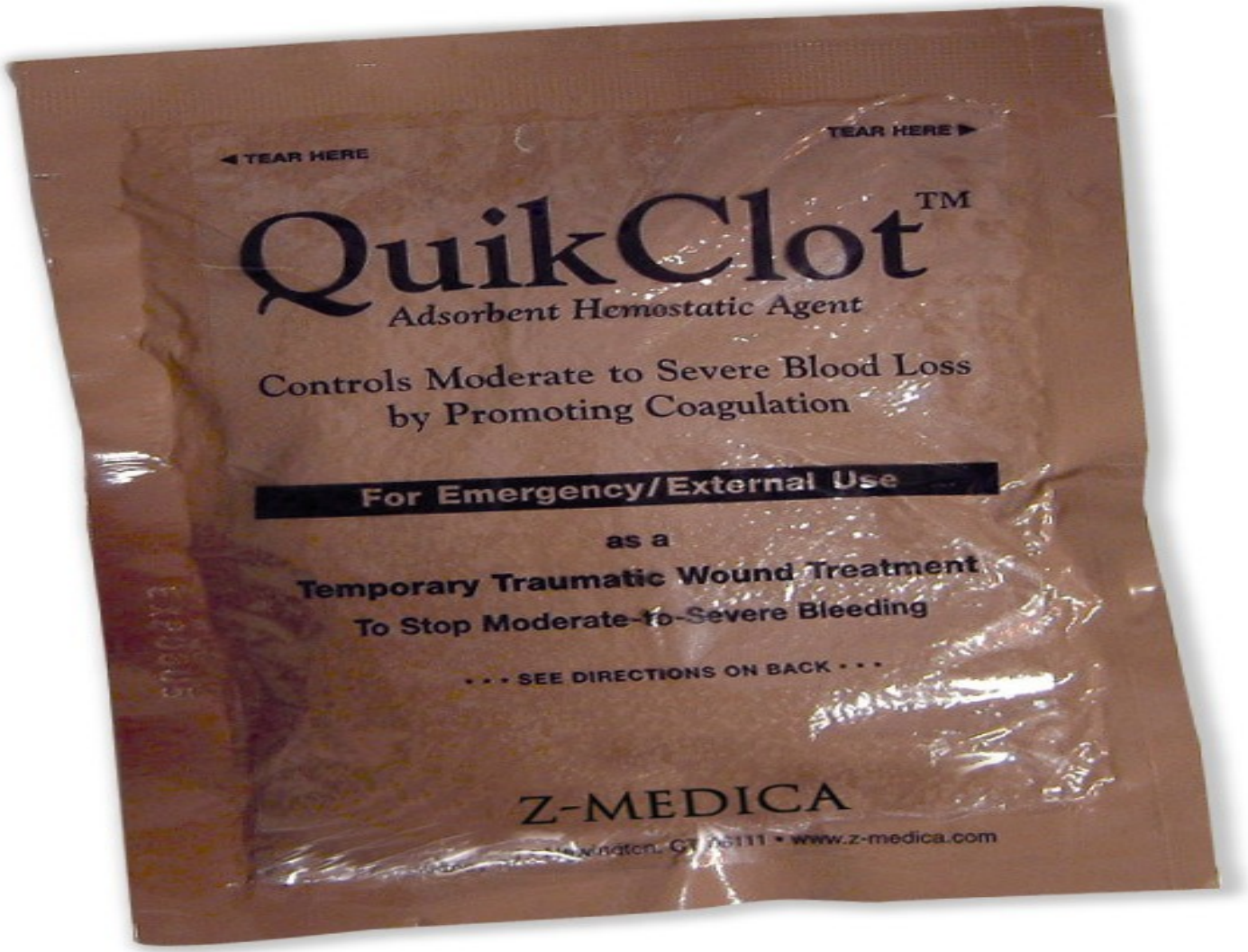
TEAR HERE
TEAR HERE
QuikClot™
Adsorbent Hemostatic Agent
Controls Moderate to Severe Blood Loss
by Promoting Coagulation
For Emergency/External Use
as a
Temporary Traumatic Wound Treatment
To Stop Moderate-to-Severe Bleeding
• • • SEE DIRECTIONS ON BACK • • •
Z-MEDICA
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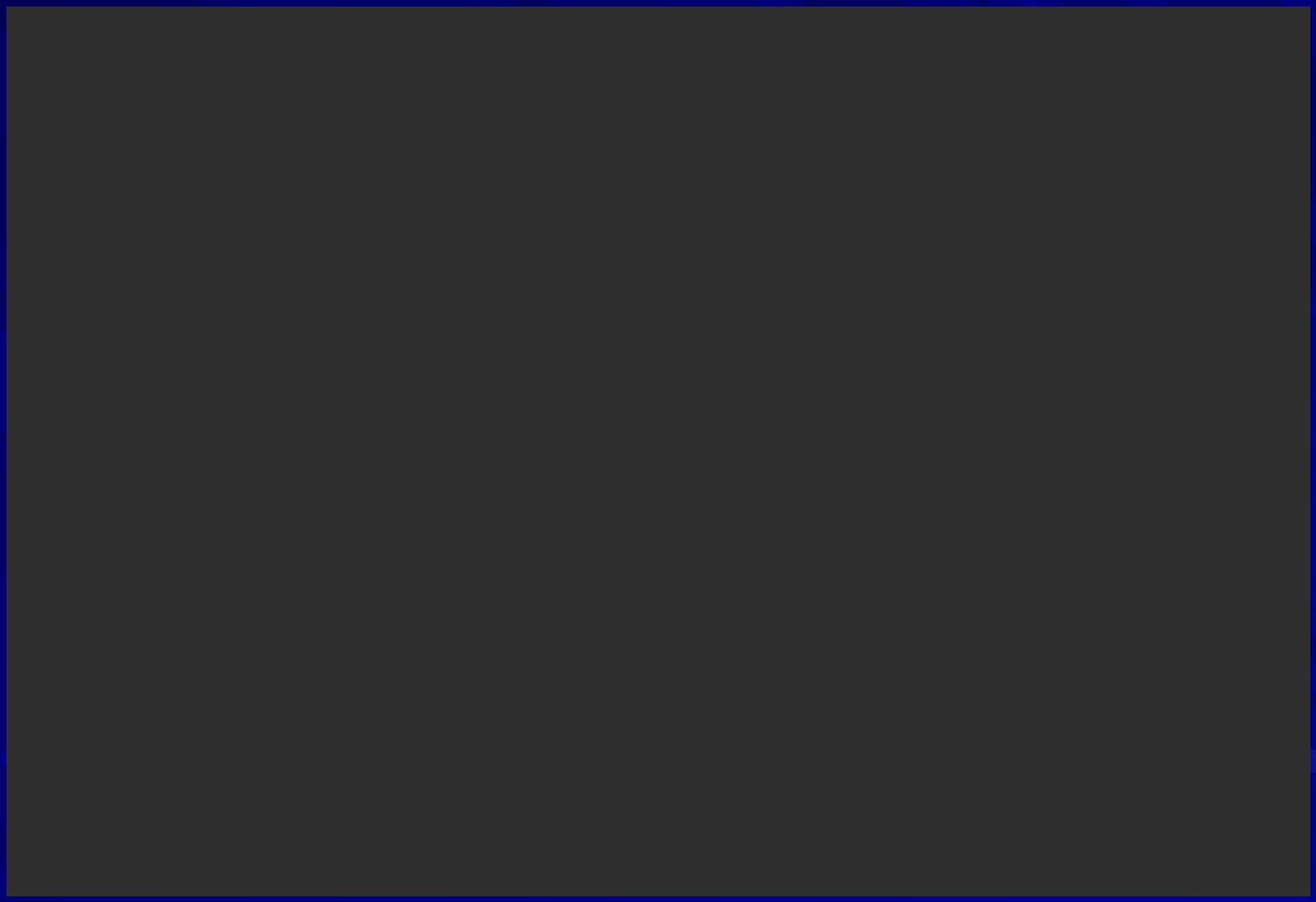
QuickClot



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QuikClot ACS®

Tactical Field Care

- IV:
- IV access must be gained next. The use of a single 18 gauge catheter is recommended, because of the ease of starting and also helps to conserve supplies.
- A Heparin or saline lock-type access tubing should be used unless the casualty needs immediate resuscitation.

Saline Lock

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Saline Lock

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Saline Lock

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Saline Lock

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Saline Lock

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Tactical Field Care

- Soldier Medics should ensure the IV is not started distal to a significant wound.
- If unable to start an IV, consideration should be given to starting sternal I/O line to pr fluids.

F.A.S.T. 1

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Tactical Field Care

- 1,000 ml of Ringers Lactate (2.4lbs) will expand the intravascular volume by 250 ml within 1 hour.

- 500 ml of 6% Hetastarch (trade name Hextend®, weighs 1.3 lbs) will expand the intravascular volu 800ml within 1 hou will sustain t n for 8 h

Tactical Field Care

- Algorithm for fluid resuscitation:
- BP verses palpable radial pulse and mentation.
- Superficial wounds (>50% injured); no immediate IV fluids needed. Oral fluids should be encouraged.

Tactical Field Care

- Any significant extremity or truncal wound (neck, chest, abdomen, pelvis).

- 1. If the casualty is coherent and has a palpable radial pulse, start a saline lock, hold fluids and reevaluate as frequently as the situation permits.

Tactical Field Care

- Fluids:
- 2. Significant blood loss from any wound, and the casualty has no radial pulse or is not coherent **- STOP THE BLEEDING -** by whatever means available - tourniquet, direct pressure, hemostatic dressings, or hemostatic powder etc. Start 500ml of Hextend®. If mental status improves and radial pulse returns, maintain saline lock and hold fluids.

Tactical Field Care

- 3. If no response is seen, give an additional 500 ml of Hextend® and monitor vital signs. If no response is seen after 1,000ml of Hextend®, consider triaging supplies and attention to more salvageable casualties.

Tactical Field Care

- 4. Because of conservation of supplies, no casualty should receive more than 1,000 ml of Hextend®. Remember this is the equivalent to more than six liters of Ringers Lactate.

Tactical Field Care

- Traumatic Brain Injury (TBI) fluid resuscitation.
- If a casualty is unconscious with a TBI and no peripheral pulse:
  - Resuscitate to restore the peripheral pulse.

Tactical Field Care

- Dress wounds to prevent further contamination and help hemostasis
  (Emergency Trauma Dressing®)
- Check for additional wounds (exit)
- Protect the patient from Hypothermia (Blizzard Survival Blanket).

Why does Hypothermia Happen?

Blizzard Survival Wrap

6 – Cell

"Ready-Heat" Blanket

4- Cell

"Ready-Heat" Blanket

Blizzard *"Survival Blanket"*

Hypothermia Prevention and Management Kit ™

Contents:
1 x Heat Reflective Skull Cap
1 x Self Heating, Four Cell Shell Liner
1 x Heat Reflective Shell

Dimensions: 7.5” x 9.5” x 3”
Weight: 2.5 lbs.
Part Number: 80-0027
NSN: 6515-01-532-8056

North American Rescue Products

Hypothermia Prevention and Management Kit ™

Field Expedient Warming

Monitoring

- Pulse oximetry may be available as an adjunct to clinical monitoring. Readings may be misleading in the settings of shock or marked hypoth

Tactical Field Care

- Pain Control:
- Able to fight -
  - Meloxicam (Mobic®) 15mg po initially
  - Acetaminophen 650 mg Bi-layered caplet 2 po q8hr
- Unable to fight -
  - Morphine 5 mg IV / IO
  - Phenergan® 25mg IV, IM

Combat Pill Pack

Tactical Field Care

- Pain Control:
- Pain control should be achieved by intravenous morphine, if possible.
- 5mg IV morphine may be given every 10 minutes until adequate pain control is achieved. If a saline lock is used it should be flushed with 5ml of sterile solution (saline, LR etc.) after morphine administration.

Tactical Field Care

- Phenergan should be used with Morphine to reduce nausea and vomiting.
- Ensure some visible indication of time and amount of morphine giv
- Soldiers who administer morphine should also be traine in its side effects and in t of Naloxone.

Future Pain Relief

Fentanyl Transmucosal Lozenge

Fentanyl Transmucosal Lozenge

- Dosage:
- 1- 400 mcg lozenge orally initially. Recommend taping it to casualty's finger as an added safety measure.
- Reassess in 15 min.
- Add a second lozenge in other cheek if necessary.
- Monitor for respiratory depression.

Future Pain Relief

Tactical Field Care

- Pain Control:

- Soldiers should avoid aspirin and other nonsteroidal anti-inflammatory medicines while in a combat zone because of detrimental effects on hemostasis.

Tactical Field Care

- Splint fractures as circumstances allow, ensuring pulse, motor and sensory (PMS) checks before and after splinting

Tactical Field Care

- Antibiotics should be considered in any wound sustained on the battlefield

Tactical Field Care

- Casualties who are awake and alert, Gatifloxacin 400 mg, one tablet Q day.
- Casualties who are unconscious:
- Cefotetan-2 gm IV / IM q 12 hours.
- Ertapenum 1 gm IV / IM QD.
- IV requires 30 infusion time.
- IM should be diluted with lidocaine.

Ertapenum Invanz®

- Reconstitute the contents of a 1 gm vial of INVANZ with 3.2 ml of 1.0% lidocaine HCl injection ** (**without epinephrine**). Shake vial thoroughly to form solution.
- Immediately withdraw the contents of the vial and administer by deep intramuscular injection into a large muscle mass (such as the gluteal muscles or lateral part of the thigh).
- The reconstituted IM solution should be used within 1 hour after preparation. **NOTE: THE RECONSTITUTED SOLUTION SHOULD NOT BE ADMINISTERED INTRAVENOUSLY.**

Antibiotics

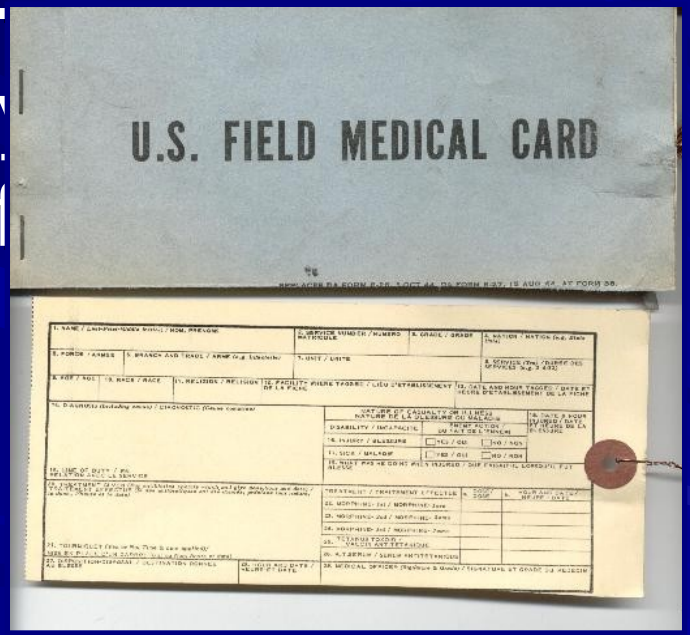
- Patients with allergies to flouroquinolones, penicillin's, cephalosporins, or other beta-lactam antibiotics may need alternate antibiotics which should be selected during the pre-deployment phase.

Reassurance

- Combat is a very frightening experience.
- Even more so if injured and especially if injured severely.
- Simple reassurance is as effective as giving morphine.
- Explain care that is being given.

Documentation

- Document clinical assessments, treatment rendered and changes in the casualty's status.
- Forward with casualty to next level of



Casevac Care

Casevac Care

- At some point in the operation, the casualty will be scheduled for evacuation. Time to evacuation may be quite variable from minutes to hours.

Casevac Care

Casevac Care

- There are only minor differences in care when progressing from the Tactical Field Care phase to the Casevac phase.
- 1. Additional medical personnel may accompany the evacuation asset and assist the soldier medic on the ground. This may be important for the following reasons:

Casevac Care

- The soldier medic may be among the casualties.
- The soldier medic may be dehydrated, hypothermic or otherwise debilitated.

Casevac Care

- The evacuation asset's medical equipment may need to be prepared prior to evacuation.
- There may be multiple casualties that exceed the capability of the soldier medic to care for simultaneously.

Casevac Care

- 2. Additional medical equipment can be brought in with the evacuation asset to augment the equipment the soldier medic already has.

- This equipment may include:

Casevac Care

- Electronic monitoring equipment capable of measuring a casualty's blood pressure, pulse and pulse oximetry

- Oxygen should be available during this phase.

Casevac Care

- Ringers Lactate at a rate of 250 ml per hour for casualties not in shock should help to reverse dehydration.

- Blood products may be available during this phase of care.

Casevac Care

- Thermal Angel® fluid warmers.
- PASG, if available, may be beneficial in pelvic fractures and helping to control pelvic and abdominal bleeding (they are contraindicated in thoracic and brain injuries).

Summary

- How people die in ground combat:

- 31% penetrating head trauma.
- 25% surgically uncorrectable torso trauma.
- 10% potentially correctable surgical trauma.

Summary

- 9% exsanguination from extremity wounds: (1st)
- 7% mutilating blast trauma.
- 5% tension pneumothorax: (2nd)
- 1% airway problems: (3rd)
- 12% died of wounds (mostly infections and complications of shock).

Summary

- Three categories of casualties on the battlefield.
- Soldiers who will do well regardless of what we do for them.
- Soldiers who are going to die regardless of what we do for them.
- Soldiers who will die if we do not do something for them (now 7-15%).

Summary

- “If during the next war you could do only two things, (1) put a tourniquet on and (2) relieve a tension pneumothorax then you can probably save between 70 and 90 percent of all the preventable deaths on the battlefield.”

COL Ron Bellamy 1993

Summary

- Medical care during combat differs significantly from the care provided in the civilian community. New concepts in hemorrhage control, fluid resuscitation, analgesia, and antibiotics are important steps in providing the best possible care to our combat soldiers.

Summary

- These timely interventions will be the mainstay in decreasing the number of combat fatalities on the battlefield.

National Stock Numbers

Combat Application Tourniquet® 6515-01-521-7976

- Hextend® Fluid 6505-01-498-8636
- F.A.S.T.1® 6515-01-453-0960
- Emergency Bandage® 6510-01-492-2275
- HemCon Chitosan Dressing® 6510-01-502-6938
- Sked Litter® 6530-01-260-1222
- Talon II Litter® 6530-01-452-1651
- Blizzard Rescue Wrap® 6532-01-524-6932
- Ready Heat Medical Blankets® 6532-01-525-4062
- Adjustable C-Collar w/head wedge 6515-01-516-3115

Questions?